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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/510,059

05/31/2005

Torbjorn Sandstrom

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EXAMINER

JELSMA, JONATHAN G

ART UNIT

PAPER NUMBER

1795

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/510,059	Applicant(s) SANDSTROM, TORBJORN	
	Examiner Jonathan Jelsma	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-61 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 October 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Summary

1. This is the initial office action based on application 10/510,059 filed on 05/31/2005 by Torbjorn Sandstrom.
2. Claims 1-61 are currently pending and have been fully considered.

Drawings

3. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 601 in Figure 6. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet,

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even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 19-22, and 49-52 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claims 19 and 49 recites the limitation "reflectivity" in line 1 of claims 19 and 49. There is insufficient antecedent basis for this limitation in the claim.

8. Claims 20-22 and 50-52 recites the limitation "said reflectivity" in lines 1 of claims 20-22 and 50-52. There is insufficient antecedent basis for this limitation in the claim.

9. The term "low" in claims 13, 31, 45 and 59 is a relative term which renders the claim indefinite. The term "low" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear what range constitutes as being low with respect to the activation energy in the film sensitive to the writing wavelength.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. Claims 1-8, 10-11, 14, 35-42, 44, 46 are rejected under 35 U.S.C. 102(e) as being anticipated by MONTGOMERY (US 2002/0182514 A1).

12. MONTGOMERY teaches a method of forming a photomask blank (paragraph 0005) comprising a silicon oxide containing substrate, with a chrome mask material, a chromium oxynitride inorganic anti-reflection layer, an organic anti-reflection layer, and chemically amplified DUV photoresist (paragraph 0052). The metal masking material may also comprise of molybdenum silicide (paragraph 0022). While not in contact with the resist, the silicon oxide substrate is taken to be facing the resist. The organic antireflective layer has a reflectivity of less than 0.5% (paragraph 0061, Table II). The photoresist layer is about 3,000 angstroms or 300 nm, which includes values slightly less than 300 nm (paragraph 0062). The direct write laser exposes images onto the photoresist (paragraph 0055). Further MONTGOMERY teaches doing an etch using a gas mixture of chlorine-oxygen-helium (paragraph 0070).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

15. Claims 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1).

16. MONTGOMERY teaches that the direct write laser exposes images onto the photoresist (paragraph 0055).

17. However, MONTGOMERY does not explicitly teach stopping the reaction in said film sensitive to the writing wavelength by exposure to a base.

18. MONTGOMERY does teach that when the film to be patterned is acidic the first neutralizer generates a nucleophile upon exposure to light to neutralize an acid species, or the first neutralizer is weakly basic and neutralizes an acid species by itself (paragraph 0011).

19. At the time of the invention one having ordinary skill in the art would have been motivated to stop the reaction in the film sensitive to the writing wavelength by exposure to the base when the film is acidic as taught by MONTGOMERY (paragraph 0011).

20. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1), in view of KITANO (US 2001/0013161 A1).

21. Claim 16 is dependent upon claim 15 which is rejected above in view of 35 U.S.C. 103(a) in view of MONTGOMERY. However, MONTGOMERY does not explicitly teach that the reaction is slowed down by exposure with an ambient gas of low humidity.

22. However, KITANO teaches supplying a gas having a humidity lower than the humidity of air in an atmosphere in order to inhibit the reaction (paragraph 0057).

23. At the time of the invention one having ordinary skill in the art would have been motivated to adjust the moisture of the system in order to inhibit the reaction because the adjustment of the humidity of the gas flow is a system variable that one skilled in the art would have been capable of adjusting in order to control the reaction time (see KITANO paragraphs 0057 and 0142).

24. Claims 18-26, 28-29, 32-33, 48-56, 58, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1), in view of SUBRAMANIAN (US 6,380,067 B1).

25. MONTGOMERY teaches a method of forming a photomask blank (paragraph 0005) comprising a silicon oxide containing substrate, with a chrome mask material, a

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chromium oxynitride inorganic anti-reflection layer, an organic anti-reflection layer, and chemically amplified DUV photoresist (paragraph 0052). The metal masking material may also comprise of molybdenum silicide (paragraph 0022). While not in contact with the resist, the silicon oxide substrate is taken to be facing the resist. The organic antireflective layer has a reflectivity of less than 0.5% (paragraph 0061, Table II). The photoresist layer is about 3,000 angstroms or 300 nm, which includes values slightly less than 300 nm (paragraph 0062). The direct write laser exposes images onto the photoresist (paragraph 0055). Further MONTGOMERY teaches doing an etch using a gas mixture of chlorine-oxygen-helium (paragraph 0070).

26. MONTGOMERY does not explicitly teach that there is a chemically inert layer on the mask. However, SUBRAMANIAN teaches the method of using the bottom anti-reflection coating layer as an etch stop layer, which acts to stop the etching process (column 4 lines 10-11, column 8 lines 22-23). The etch stop layer functionality is taken to be analogous to the inert properties, since it functions to stop the chemical etch.

27. At the time of the invention one having ordinary skill in the art would have been motivated to use a material for the antireflection layer which acts as an inert etch stop layer as taught by SUBRAMANIAN in the photomask blank of MONTGOMERY so that the anti-reflection layer would not have to be removed (abstract SUBRAMANIAN).

28. With respect to claim 33. MONTGOMERY teaches that the direct write laser exposes images onto the photoresist (paragraph 0055).

29. However, MONTGOMERY does not explicitly teach stopping the reaction in said film sensitive to the writing wavelength by exposure to a base.

30. MONTGOMERY does teach that when the film to be patterned is acidic the first neutralizer generates a nucleophile upon exposure to light to neutralize an acid species, or the first neutralizer is weakly basic and neutralizes an acid species by itself (paragraph 0011).

31. At the time of the invention one having ordinary skill in the art would have been motivated to stop the reaction in the film sensitive to the writing wavelength by exposure to the base when the film is acidic as taught by MONTGOMERY (paragraph 0011).

32. Claim 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1), in view of SUBRAMANIAN (US 6,380,067 B1), and further in view of KITANO (US 2001/0013161 A1).

33. Claim 34 is dependent upon claim 32 which is rejected above in view of 35 U.S.S. 103(a) in view of MONTGOMERY and SUBRAMANIAN. However, neither MONTGOMERY nor SUBMRAMANIAN explicitly teaches that the reaction is slowed down by exposure with an ambient gas of low humidity.

34. However, KITANO teaches supplying a gas having a humidity lower than the humidity of air in an atmosphere in order to inhibit the reaction (paragraph 0057).

35. At the time of the invention one having ordinary skill in the art would have been motivated to adjust the moisture of the system in order to inhibit the reaction because the adjustment of the humidity of the gas flow is a system variable that one skilled in the art would have been capable of adjusting in order to control the reaction time (see KITANO paragraphs 0057 and 0142).

36. Claims 9 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1) in view of KISHIMURA (US 2002/0013059 A1).

37. Claim 9 is dependent upon claim 1, and claim 43 is dependent upon claim 35, both of which have been rejected above in view of MONTGOMERY under 35 U.S.C. 102(e). However, MONTGOMERY does not explicitly teach using a photoresist layer with a thickness less than 200 nm. MONTGOMERY does state that the preferred photoresist layer would be about 300 nm, because of anticipated resist film loss associated with the etch process of 100 -150 nm (paragraph 0062).

38. KISHIMURA then teaches forming a chemically active resist of a thickness of 200 nm (paragraph 0074). At the time of the invention one having ordinary skill in the art would have been motivated to have the photoresist thickness of MONTGOMERY to be 200 nm or less as taught by KISHIMURA and still remain above the resist thickness estimated lost during the etch process, in order to use the least amount of resist possible, reducing the cost.

39. Claims 27 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1) and SUBRAMANIAN (US 6,380,067 B1), and in view of KISHIMURA (US 2002/0013059 A1).

40. Claim 9 is dependent upon claim 1, and claim 43 is dependent upon claim 35, both of which have been rejected above in view of MONTGOMERY and SUBRAMANIAN under 35 U.S.C. 103(a). However, neither MONTGOMERY nor SUBRAMANIAN explicitly teaches using a photoresist layer with a thickness less than

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200 nm. MONTGOMERY does state that the preferred photoresist layer would be about 300 nm, because of anticipated resist film loss associated with the etch process of 100 -150 nm (paragraph 0062).

41. KISHIMURA then teaches forming a chemically active resist of a thickness of 200 nm (paragraph 0074). At the time of the invention one having ordinary skill in the art would have been motivated to have the photoresist thickness of MONTGOMERY to be 200 nm or less as taught by KISHIMURA and still remain above the resist thickness estimated lost during the etch process, in order to use the least amount of resist possible, reducing the cost.

42. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1) in view of PAVELCHEK (US 2002/0195419 A1).

43. Claim 12 is dependent upon claim 1, which is rejected above in view of MONTGOMERY under 35 U.S.C. 102(e). MONTGOMERY does not explicitly teach etching the exposed mask blank with a gas mixture comprising fluorine. However, MONTGOMERY does teach that the antireflective layer may be composed of silicon nitride for example (paragraph 0024). The direct write laser exposes images onto the photoresist (paragraph 0055).

44. PAVELCHEK then teaches that when the antireflective layer comprises a silicon inorganic component it can be selectively etched with a fluorine based plasma (paragraph 0016), which anticipates the limitation requiring a gas mixture of fluorine. Further PAVELCHEK teaches that the activation energy in the resist layer to activate

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the photoactive compound of the resist may range from 3 to 300 mJ/cm² depending on the exposure tool (paragraph 0050) which is taken to be low.

45. At the time of the invention one having ordinary skill in the art would have been motivated to use an etching plasma gas mixture comprising fluorine in the method and mask of MONTGOMERY because PAVELCHEK teaches that it is preferable to use the fluorine based plasma for antireflective films comprising silicon (paragraph 00016).

46. Claims 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1) and SUBRAMANIAN (US 6,380,067 B1), further in view of PAVELCHEK (US 2002/0195419 A1).

47. Claim 30 is dependent upon claim 18, which is rejected above in view of MONTGOMERY and SUBRAMANIAN under 35 U.S.C. 103(a). Neither MONTGOMERY nor SUBRAMANIAN explicitly teaches etching the exposed mask blank with a gas mixture comprising fluorine. However, MONTGOMERY does teach that the antireflective layer may be composed of silicon nitride for example (paragraph 0024). The direct write laser exposes images onto the photoresist (paragraph 0055).

48. PAVELCHEK then teaches that when the antireflective layer comprises a silicon inorganic component it can be selectively etched with a fluorine based plasma (paragraph 0016), which anticipates the limitation requiring a gas mixture of fluorine. Further PAVELCHEK teaches that the activation energy in the resist layer to activate the photoactive compound of the resist may range from 3 to 300 mJ/cm² depending on the exposure tool (paragraph 0050) which is taken to be low.

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49. At the time of the invention one having ordinary skill in the art would have been motivated to use an etching plasma gas mixture comprising fluorine in the method and mask of MONTGOMERY because PAVELCHEK teaches that it is preferable to use the fluorine based plasma for antireflective films comprising silicon (paragraph 00016).

50. Claims 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1), in view of PAVELCHEK (US 2002/0195419 A1).

51. Claim 45 is dependent upon claim 35 which is rejected above in view of MONTGOMERY under 35 U.S.C. 102(e). MONTGOMERY does not explicitly teach that the film sensitive to the writing wavelength has a low activation energy.

52. PAVELCHEK teaches that the activation energy in the resist layer to activate the photoactive compound of the resist may range from 3 to 300 mJ/cm² depending on the exposure tool (paragraph 0050) which is taken to be low.

53. At the time of the invention one having ordinary skill in the art would have been motivated to use exposing energy of the exposure tool for the same photoresist in the method and mask of MONTGOMERY because PAVELCHEK teaches that the activation energy for the same resist may be low (paragraph 00016).

54. Claims 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1), in view of SUBRAMANIAN (US 6,380,067 B1) and further in view of PAVELCHEK (US 2002/0195419 A1).

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55. Claim 59 is dependent upon claim 48 which is rejected above in view of MONTGOMERY and SUBRAMANIAN under 35 U.S.C. 103(a). Neither MONTGOMERY nor SUBRAMANIAN explicitly teach that the film sensitive to the writing wavelength has a low activation energy.

56. PAVELCHEK teaches that the activation energy in the resist layer to activate the photoactive compound of the resist may range from 3 to 300 mJ/cm² depending on the exposure tool (paragraph 0050) which is taken to be low.

57. At the time of the invention one having ordinary skill in the art would have been motivated to use exposing energy of the exposure tool for the same photoresist in the method and mask of MONTGOMERY because PAVELCHEK teaches that the activation energy for the same resist may be low (paragraph 00016).

58. Claims 17 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1), in view of CORDES (US 4,617,252).

59. Claim 17 is dependent upon claim 1, and claim 47 are dependent upon claim 35, both of which are rejected above in view of MONTGOMERY under 35 U.S.C. 102(e). However, MONTGOMERY does not explicitly teach forming a film of adhesive promoter.

60. However, CORDES teaches applying a film of an adhesion promoter (column 11 lines 1-14).

61. At the time of the invention one having ordinary skill in the art would have been motivated to apply a film of an adhesion promoter as taught by CORDES to the

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photomask blank of MONTGOMERY in order to promote the adhesion of the antireflective layer (CORDES column 11 lines 7-11).

62. Claim 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over MONTGOMERY (US 2002/0182514 A1), in view of SUBRAMANIAN (US 6,380,067 B1), and further in view of CORDES (US 4,617,252).

63. Claim 61 is dependent upon claim 48 under 35 U.S.C. 103(a) in view of MONTGOMERY and SUBRAMANIAN. However, neither MONTGOMERY nor SUBRAMANIAN explicitly teaches forming a film of adhesive promoter.

64. However, CORDES teaches applying a film of an adhesion promoter (column 11 lines 1-14).

65. At the time of the invention one having ordinary skill in the art would have been motivated to apply a film of an adhesion promoter as taught by CORDES to the photomask blank of MONTGOMERY and SUBRAMANIAN in order to promote the adhesion of the antireflective layer (CORDES column 11 lines 7-11).

Conclusion

66. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Jelsma whose telephone number is (571)270-5127. The examiner can normally be reached on Monday to Thursday 7:00 a.m. - 5:00 p.m.

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67. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on (571)272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

68. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark F. Huff/
Supervisory Patent Examiner, Art Unit 1795

JGJ